Smarter Grids for California and the Planet

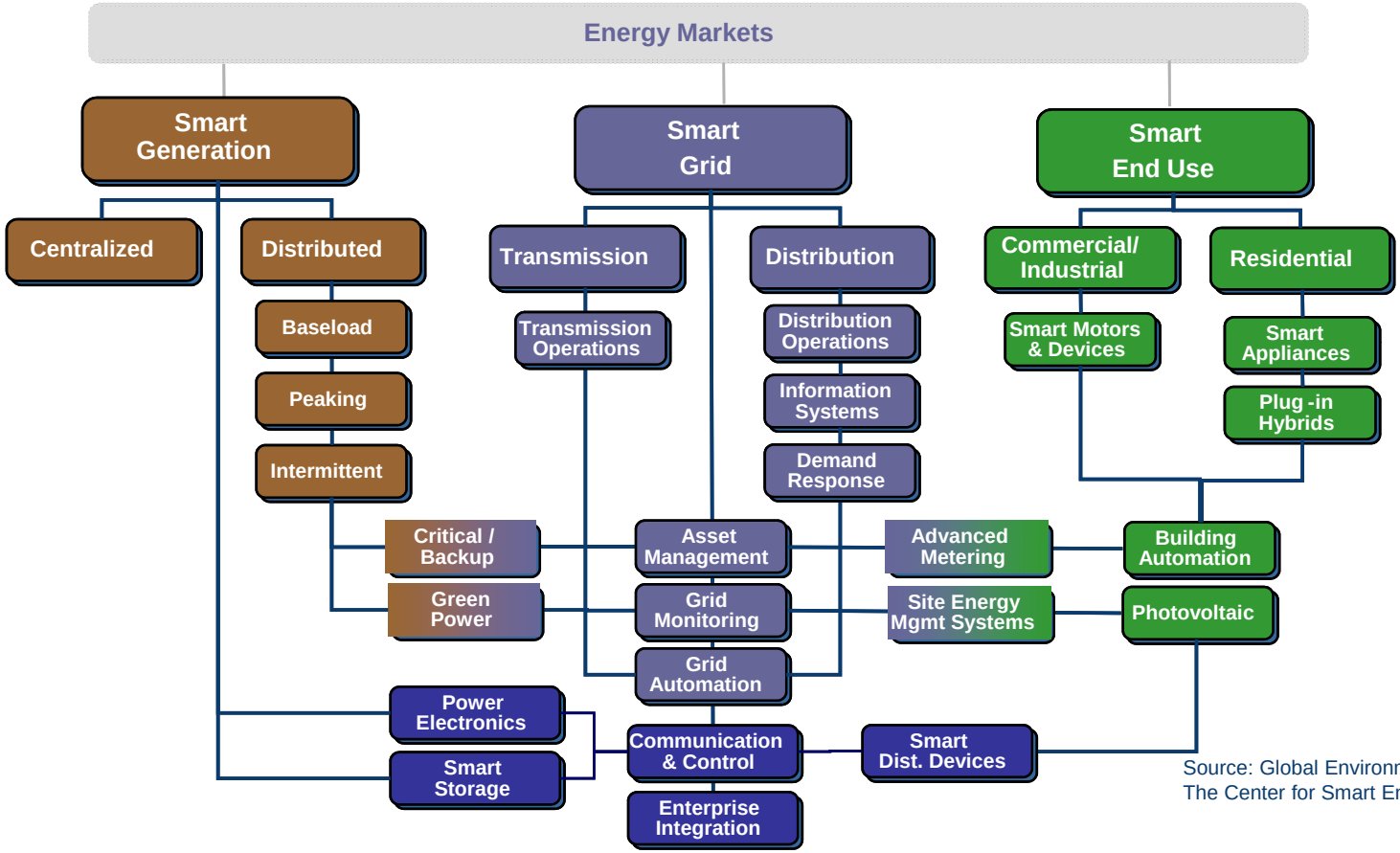
KEMA's Perspective and Observations

CEC Workshop on Defining the Pathway to the

California Smart Grid of 2020

Sacramento CA
August 5, 2008

The Smart Grid/Utility of the Future (UoF) will require a holistic approach by regulators, utilities and consumers



Source: Global Environment Fund and The Center for Smart Energy

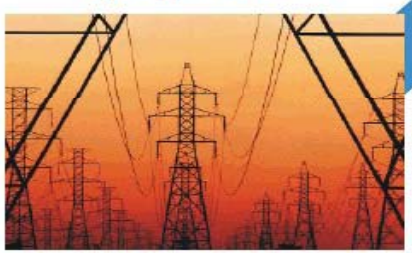
Production – Delivery – Consumption – Storage - all play key roles

KEMA

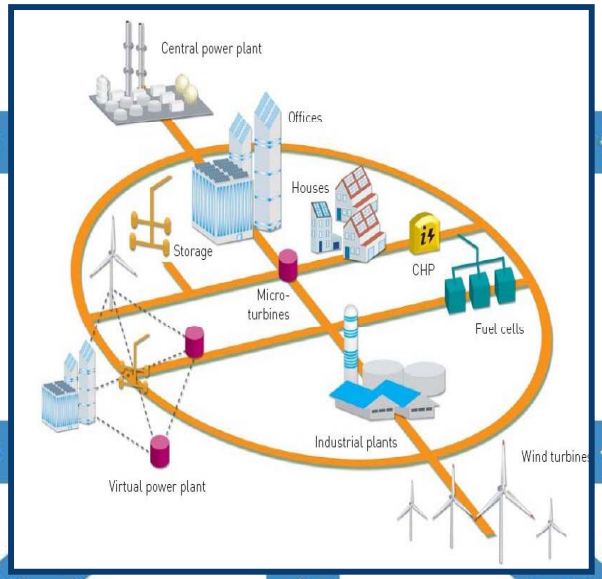
The UoF will operate as an Intelligent Network, with a portfolio of technologies and advanced communications

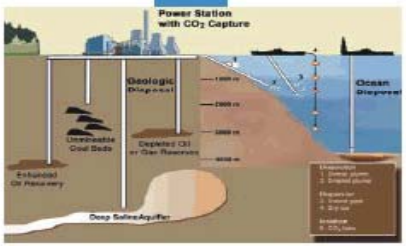
Efficiency in Buildings, Industry and End-Use Products

Vehicles: Efficiency, Hydrogen Fuel Cells

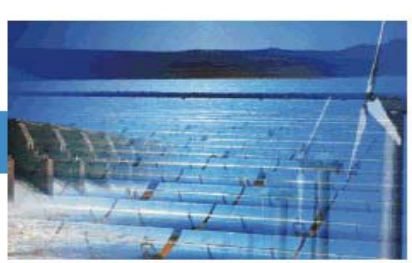


Advanced Power Generation and Grids





CO_2 Capture and Storage



Renewable Energy Technologies

Biomass, Synfuels, CHP

Advanced Nuclear Fission and Fusion

Source: International Energy Agency (Vigotti)

KEMA

KEMA's working definition…

Smart Grid is the networked application of digital technology to the energy production, delivery and consumption segments of the utility industry. More specifically, it incorporates advanced applications and use of distributed energy resources, communications, information management, and automated control technologies to modernize, optimize, and transform electric power infrastructure.

The Smart Grid vision seeks to bring together these technologies to make the grid self-healing, more reliable, safer, and more efficient, as well as empower customers to use electricity more efficiently.

It also seeks to contribute to a sustainable future that encompasses improvements to national security, economic growth, and climate change.

Why does the grid need to become “smart”?

- Existing generation, transmission, and distribution infrastructure is rapidly aging and out of synch with new digital technology
- Loss of experience due to aging of core utility workers with the “know how” to operate and maintain existing grid
- Large-scale deployment of DG and renewable resources is having dramatic impacts on grid operation and planning
- Carbon legislation is on the horizon and new technologies and practices are needed to meet our sustainable needs

Running today's digital society through yesterday's grid is like running the Internet through an old telephone switchboard

Reid Detchon, Energy Future Coalition

KEMA

What broad goals must Smart Grid 2020 include?

- ❑ Facilitate innovation and investment in next generation of energy solutions.
- ❑ Holistic assessment of impact of Smart Grid technologies (markets, reliability, economics).
- ❑ Accelerate deployment of renewables and conservation/demand response.
- ❑ Enhance system reliability and operability.
- ❑ Empower role of consumers.

Energy storage applications will be critical to success of renewable deployment – both centralized and distributed

Storage Functions

- Fast storage for system regulation
- Storage to mitigate wind/solar volatility
- Behind the meter storage coupled to DG and/or DR
- Other ancillary and energy products to be identified

Storage Forms

- Advanced Batteries
- Superconducting Magnetic Energy Storage (SMES)
- Flywheels
- Capacitors
- Compressed Air
- Pumped Hydro
- Hydro Energy Island

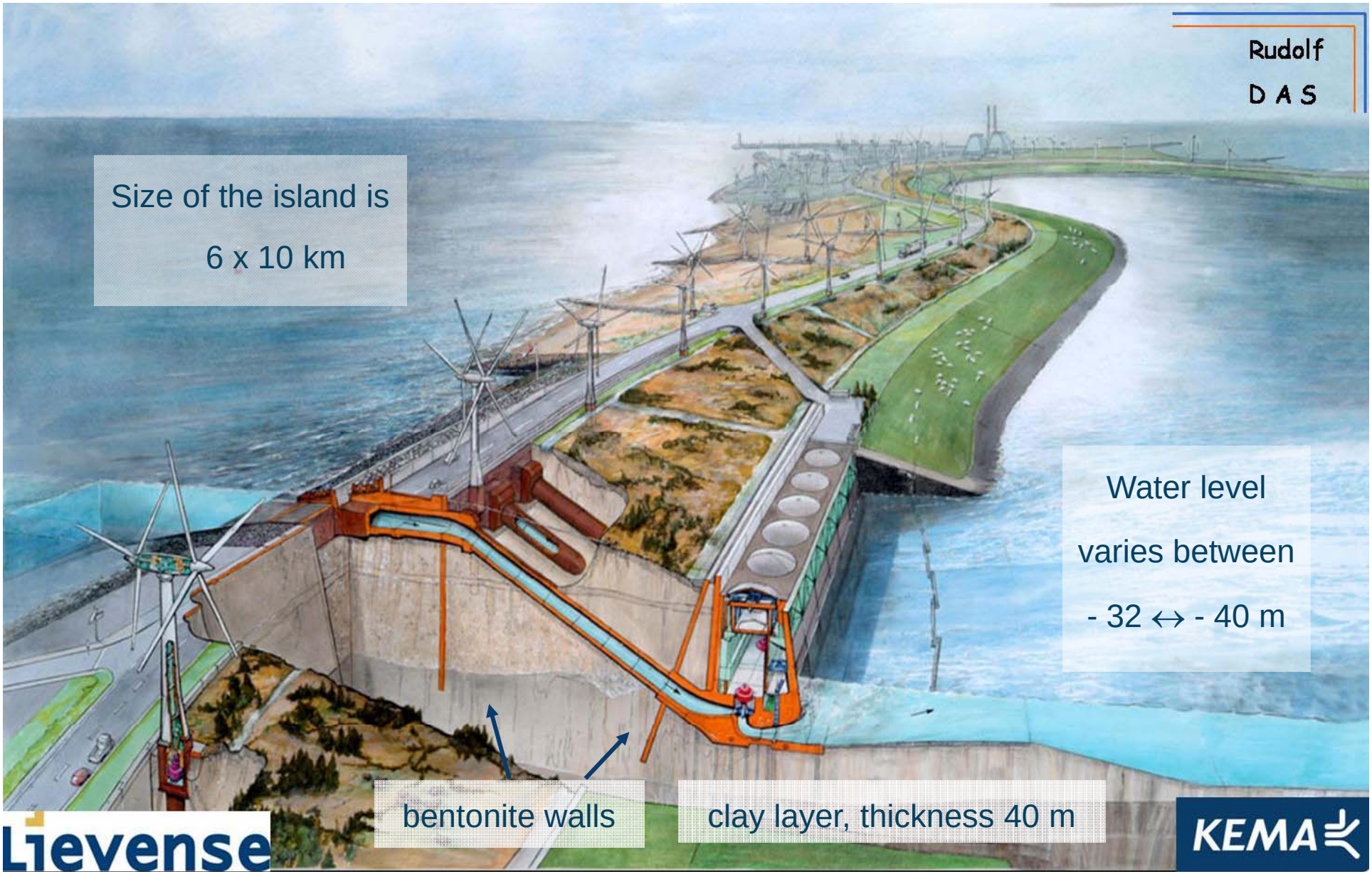
KEMA

One storage concept being explored in Europe is "Energy Island"

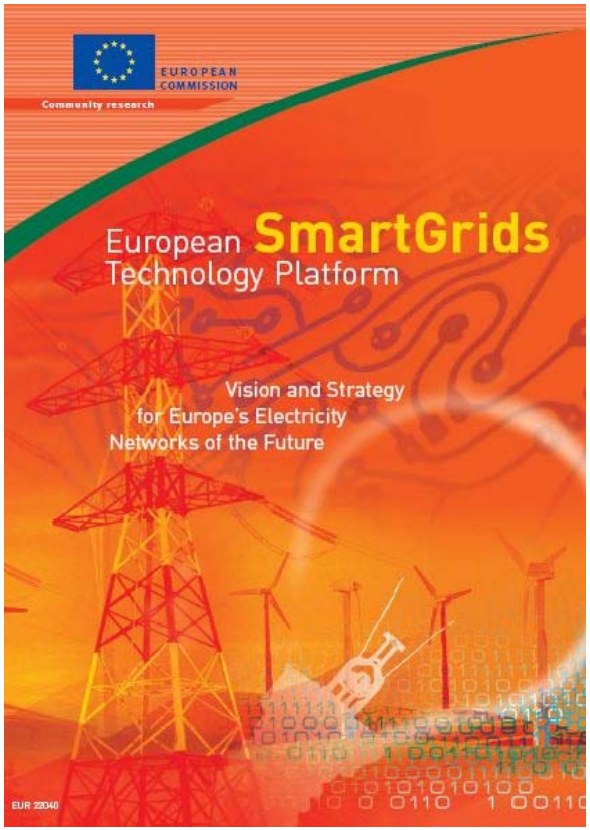
Artificial Island in the North Sea

- A 40-meter, deep dredged open pit enclosed by a ring of dikes containing 1,500 MW / 30 GWh for Energy Storage
- Island can be constructed with the sand of the pit
- Space for 300-400 MW of wind turbines
- Other forms of energy possible (e.g., tidal, wave energy, biomass)

Artist impression of the Energy Island



Vision and Strategy of the European Union's SmartGrid Technology Platform



- Ensure that tomorrow's grid will fullfill Europe's future needs
- Identify research needs and build support for an increased public and private research effort on electric energy (€2.3billion over 7 years)
- Align ongoing R&D projects and new European, national and regional programs on electric T&D systems
- Develop recommendations for implementation of the strategic research agenda and technology deployment

California and US SmartGrid research initiatives should draw upon this available pool of intellectual capital

What role should consumer values play in SmartGrid deployment?

Conclusion – The evolution of California Smart Grid 2020 should recognize that no utility investment in smart grid will be fully justified unless it gives the consumer an opportunity to be engaged and active as a participant, with clearly articulated value drivers

Smart Grid 2020 will communicate clear vision and value of DR programs to consumers

- ❑ Accentuate the Positive: Consumers are attracted to options that allow them to be a responsible consumer and to manage their costs.
- ❑ No ‘Big Brother’ Mandates: Consumers want choice and Smart Grid must be presented as an opportunity.
- ❑ Avoid Techno-jargon: Translate the need and benefits into consumer-friendly language.
- ❑ Fly the Green Flag: Successful design should highlight energy efficiency and climate change benefits.

KEMA

One day, our options will reflect a smarter planet